Carbon Capture and Utilization – CFD simulation/reactor design; Process analysis and economic assement

Introduction:

It is widely accepted that an increasing atmospheric CO_2 concentration may result in the global warming of our planet. Many initiatives focus on CO_2 capture from the industrial exhaust. An alternative is to tackle this problem by capturing CO_2 directly from the atmosphere thereby eliminating the location restriction. The captured CO_2 can be used for the production of liquid fuels, chemicals, or carbonation of soft drinks. The objective of the present research is to design, develop, and test a novel, solid sorbent-based direct air capture reactor which captures CO_2 from the ambient air and releases it as a CO_2-rich gas suitable for further use.

Assignments:

The assignments include the development of numerical and thermodynamic models pertaining to the carbon capture reactor and the complete process of the proposed system. These models will consider the various aspects of the proposed systems, including energy efficiency, material performance, and their impact on the overall efficiency of the process. They will be used to perform parametric studies and optimization of the proposed system. The assignment also includes a cost analysis of the complete system. The final assignment tasks will be defined after consultation with the student.

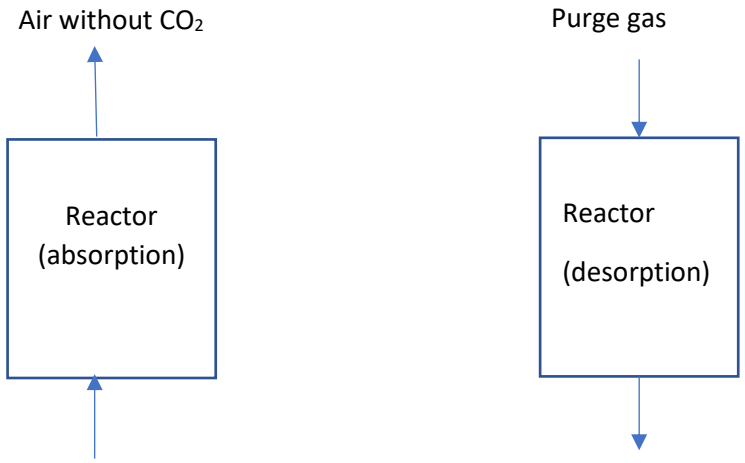

Figure 1 scheme of capturing CO_2 from ambient air (left), and releasing a CO_2-rich gas (right) in a reactor with solid sorbents.

1) Feasibility study, Techno-economics, Conceptual design of the reactor (suitable for SET students)
2) CFD modeling of the reactor (suitable for ME students who passed CFD or transport phenomena courses)

Your background: We are looking for excellent master students with a Mechanical Engineering or Sustainable Energy Technology background.

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